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A Study on Effect of Favorite Film Songs on Heart Rate Variability (HRV) and Heart Rate (HR) with Moderate Exercise

Manibalanvijayaraman

Assistant Professor, Department of Physiology, Vinayaka Mission's Medical College & Hospital, Karaikal–609609, Puducherry

Abstract

Introduction: Heart rate variability (HRV) is the physiological event of variation in the time interval between heart beats. It is measured by the variation in the beat-to-beat interval (R-R interval).The present study aimed at determining the effect of favorite film songs on HRV and HR with moderate exercise.

Materials and Method: This was a cross sectional observational study conducted in the department of physiology, Vinayaka mission's medical college & hospital. Participants were allowed to select favorite slow tempo and fast tempo film songs. Selected songs were played (4-5 minutes) before and during exercise, with 30 minute interval (each day N=10) and their HRV and HR were measured by using time and Frequency domain method. (Standard instrumental protocol was followed).

Results: In this study, participants were able to do exercise at a lower HR with a slow tempo film song when compared to no music or film song during exercise the cardiac activity the HR and HRV was improved and fast recovery too. It was observed that the musical therapy improved the time and frequency domain indices of HRV.

Conclusion: The present study clearly indicates that, a particular favorite tempo of a film song or music has a beneficial effect on HRV and HR changes through the involvement of the PSNS and SNS.

Keywords: *Favorite film songs, Heart rate variability, Heart rate.*

Introduction

Heart rate variability (HRV) is the physiological event of variation in the time interval between heart beats. It is measured by the variation in the beat-to-beat interval (R-R interval).[1] The beat-to-beat alterations in HRV, is an accurate and reliable reflection of the many physiological factors modulating the normal rhythm of the heart. Further, HRV testing is a prognostic (predictive) indicator of cardiac condition, fitness, stress levels, aging, health risk levels and chronic disease condition.[2]

HRV is the immediate variation in heart rhythm due to ANS influences on the Sinoatrial node (SA node).Previous researchers showed that the high HRV indicating good health and a high level of fitness, whilst decreased HRV is linked to stress, fatigue and even burnout. The intervention of music indicating positive effect on HRV. [3]An individual's relaxation response is based on his music generi, which is composed of different basic compositional elements, such as melody, rhythm, harmony, and tonality. Earlier studies had shown the relaxation effects of classical music at both the subjective and objective levels.[4]

Corresponding Author:
Manibalanvijayaraman
Assistant Professor, Department of Physiology,
Vinayaka Mission's Medical College & Hospital,
Karaikal–609609, Puducherry
Mobile No.: 9941163012
e-mail: dr.manibalan@gmail.com

It was also indicated that the music therapy has positive effects on HRV in sick patients and also soothing music has a significant effect on decreased HR and improved HRV in healthy youth. HRV alterations relate to the rhythm of the particular type of music.[3] The classical, meditation or relax music are capable of bringing out a number of health benefits including, raising states of consciousness, lowering stress level, changing moods and accessing different states of mind.[5]

Individualizing the type of music used is vital to the success of music therapy and the degree of love towards music is the most important factor in relaxation. In recent years, most of the individuals prefer film songs as a part of relaxation and also individual's preference may vary such as slow tempo or fast tempo songs. These days most of the people while jogging, doing exercise or fitness training frequently, listen to music through the headphone or earphone.

The present study aimed at determining the effect of favorite film songs on HRV and HR with moderate exercise.

Materials and Method: This was a cross sectional observational study conducted in the department of physiology, Vinayaka mission's medical college & hospital. Study was explained to the participants and informed consent was obtained. Study was approved by institutional ethical committee.

Song and Music Selection: Prior to the experimental session, participants were asked to self-report a title of their most favorite film songs (Song by the human voice with composed instrumental music) orally confirmed. Depending on their interest, the fast and slow tempo selected film songs played, then the songs or music were separated based on tempo, the tempo was calculated based on beats/ minute. The Piston soft BPM Detector software was used to find the tempo of a song. 70-80 beats/ minute (BPM) consider as slow tempo, 140-160 beats/minute songs were fast tempo, medium tempo 90-100 beats/ minute.

Film song Intervention:

A. For favorite slow tempo film song intervention, a complete slow song was played (4-5 minutes) before and during exercise, with 30 minute interval (each day N=10) and their HRV and HR were measured.

B. For favorite fast tempo film song intervention, a complete fast tempo song was played (4-5 minute) before and during exercise, with 30 minute interval (each day N=10) and their HRVand HR.

Exercise: In this study, Bicycles Ergometer for exercise was used. All the participants were instructed pre-test one week before the testing to overcome factors that could alter HRV. They will be asked to avoid heavy physical activity, smoking and alcohol and other beverages affect physical activity.

HRV Analysis: Time and Frequency domain method. (Standard instrumental protocol was followed)

Inclusion Criteria: Participants (N= 310) included 160 males and 150 females with an average age of 19 years (ranging from 18 to 23) with normal body weight. All the participants were tested initially -physical fitness, body mass index (BMI), height, waist and hip circumference, The participant's weight was calculated by a digital balance (INCO, India), BMI and with normal body weight and further the participants reported no significant hearing loss and no cardiac conditions were included in the study.

Exclusion Criteria: The participants were screened for self-reported hearing loss and cardiac history using a screening questionnaire. Participants with significant hearing loss or cardiac anomalies, diabetic, pregnant, heart failure, acute and chronic renal failure or any chronic diseases were excluded from the study.

Statistical Analysis: Descriptive data are expressed as mean ± SD, ONE WAY ANOVA was used to analyze the HRV and HR. The level of significance was analyzed. All data were analyzed using SPSS for Windows version 17.0.

Results

A total of 310 participants included in the study. 160 males and 150 females with an average age of 19 years (ranging from 18 to 23). This present study showed that the selected young subjects were able to do exercise at a lower HR with a slow tempo film song or slow tempo instrumental music when compared to no music or film song during exercise the cardiac activity the HR and HRV was improved and fast recovery too.

Table 1: Effect of slow tempo film song on HR. (Frequency Domain Analysis)

Parameters normalized units (nu)	No song played (baseline) Mean ±SD	Slow tempo film song Mean ±SD	Exercise only No song played Mean ±SD	Exercise + slow tempo film song Mean ±SD	P value
Low frequency(LF)Hz	39.82±5.25	39.02±4.21	50.48±5.31	49.08±4.81	P<0.001
High frequency (HF)Hz	60.74±5.47	63.33±3.39	48.91±5.80	54.95±6.37	P<0.001
LF/HFms²	0.864±0.05	0.602±0.05	1.07 ±0.16	0.88±0.23	P<0.001

Mean values of low frequency (LF), High Frequency (HF) and LF/HF. (Values are Mean ± SD), Pvalue<0.001 is significant. (N=310)

Table 2: Effect of fast tempo film songs on HRV (Frequency Domain Analysis)

Parameters normalized units(nu)	No song played (baseline) Mean ±SD	Fast tempo song Mean ±SD	Exercise only No song played Mean ±SD	Exercise + Fast tempo song Mean ±SD	P value
Low frequency(LF)Hz	61.44±5.36	63.32±3.24	51.61±6.80	56.83±5.23	P<0.001
High frequency(HF)Hz	41.83±6.22	36.02±4.31	50.49±4.31	45.06±4.21	P<0.001
LF/HFms²	1.391±0.04	1.839±0.06	1.013 ±0.04	1.214±0.18	P<0.001

Mean values of low frequency (LF), High Frequency (HF) and LF/HF. (Values are Mean ± SD), P value<0.001 is significant. (N=310)

Table 3: Effect of Slow tempo film song on HR and HRV SDNN and RMSSD (Time domain analysis)

Parameters	No song played (baseline) Mean ±SD	Slow tempo song Mean ±SD	Exercise only No song played Mean ±SD	Exercise + slow tempo film song Mean ±SD	P value
Mean RR(ms)	804.32±11.92	706.75±10.5	550.54±6.11	700.74±6.99	
SDNN(ms)	64.10±11.11	55.11±2.11	50.32±14.32	76.84± 3.11	
Mean HR (beats/minute)	78.24±3.2	68.5±11.21	98.2±3.4	80±3.96	P<0.001
RMSSD(ms)	45.17±13.21	40.32±7.88	45.22±12.3	70.99±4.67	
NN50	7.67±5.4	6.55±4.37	5.76±11.89	15.81±6.48	

The R-R Interval between R to R,Heart rate (HR), The Standard deviation of normal-to-normal R-R intervals (SDNN), the percentage of the adjacent RR intervals with a difference of duration greater than 50 ms (pNN50) and root-mean square of differences (RMSSD) between the adjacent normal RR intervals in a given time interval (N=310).

Table 4: Effect of Fast tempo song on HR and HRV SDNN and RMSSD (Time domain analysis)

Parameters	No song played (baseline) Mean ±SD	Fast tempo song Mean ±SD	Exercise only No song played Mean ±SD	Exercise + Fast tempo film song Mean ±SD	P value
Mean RR (ms)	704.33±11.92	606.76±13.5	600.54±7.11	807.84±6.99	
SDNN (ms)	65.10±12.11	60.12±10.11	55.32±14.32	77.84± 3.11	
Mean HR (beats/mintes)	78.24±32	89.7±11.21	100.2±3.9	120±3.56	P<0.001
RMSSD (ms)	45.17±13.21	40.32±7.88	45.22±12.3	70.99±4.67	
NN50	10.67±13.4	8.56±4.37	6.77±12.89	15.81±8.98	

The RR interval between R to R, heart rate (HR), The Standard deviation of normal-to-normal R-R intervals (SDNN), the percentage of the adjacent RR intervals with a difference of duration greater than 50 ms (pNN50) and root-mean square of differences (RMSSD) between the adjacent normal RR intervals in a given time interval.

Discussion

In this study, participants were able to do exercise at a lower HR with a slow tempo film song when compared to no music or film song during exercise the cardiac activity the HR and HRV was improved and fast recovery too. The relation of music to emotion has been studied for decades and the literature is fruitful.[6]

Our results showed that the favorite slow song has a definite peaceful effect on exercise induced changes in HRV which is in agreement with the work of Pal et al.[7]In their study, the practice of relaxation of song therapy has significant effect in lowering the LF/HF ratio of HRV inparticipants. The present study showed that, listening to slow tempo film songs during exercise increases the HF and listening fast tempo film song or fast tempo music listening during exercise increases the LF. Increased HF indicates PSNS tone increased. [8]But, LF index communicates to both vagal and sympathetic influences on the heart, yet providing predominance of the sympathetic component.[9]

Chuang and co-workers investigated the effects of long-term, 8-month music therapy intervention on autonomic function in anthracycline-treated breast cancer patients. Theauthors observed that the musical therapy improved thetime and frequency domain indices of HRV.[10]Studies on competition stress have been observed to decrease HRV and alter the power spectrum by decreasing the High Frequency (HF) component, increasing the Low Frequency (LF) component.[11] Experimental studies have also shown that athletes report increased positive affect and reduced negative effect in conditions where they listen to arousing music, compared to no music, during moderate to high intensity activity.[12]

As per the study conducted by Lathaet al. The observations obtained revealed that heart rate and mean RR intervals showed significant changes between the music and non-music group in both genders and there was a significant decrease in the RMSSD, SDNN and PNN50 in the male population suggesting a shift towards enhanced vagal activity. From this it could be inferred that music has beneficial effect on the heart rate variability thus favouring cardiovascular health in its long run.[13]

The present study had limitations that affect generalized ability of its results. The study was conducted acute, only in the age group of 18 to 23-years-old with normal BMR. Moreover, only healthy subjects were evaluated in order to homogenize the study sample.

Conclusion

The present study clearly indicates that, a particular favorite tempo of a film song or music have a beneficial effect on HRV and HR changes through the involvement of the PSNS and SNS.

Ethical Clearance: Taken from institutional ethical committee

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Conflict of Interest: Nil

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